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July 1, 1998

Secretary, Federal Communications Commission
Office of the Secretary
Federal Communications Commission
1919 M Street N.W.
Washington, D.C. 20554

Re: MM Docket No. 97-217
File No. RM-9060
Comments on ex-parte presentations

Dear Sir:

You will find enclosed the original plus ten copies of the comments of EDX Engineering, Inc. in MM Docket No. 97-217, File No. RM-9060 regarding ex-parte presentations.

If you have any questions, please call.

Sincerely,

Harry R. Anderson, Ph.D., P.E.
President and CEO

Enclosures

No. of Copies rec'd 0+10
List A B C D E

Proposed Rulemaking No. RM-9060
MM Docket No. 97-217

Comments of EDX Engineering, Inc. on Ex-Parte Presentations

1. Introduction

In the proposed Rulemaking No. RM-9060, the Federal Communications Commission is proposing to change the Rules for the MDS service to allow, among other things, enhanced two-way operation for MDS licensees. To accommodate enhanced two-way service, the proposed Rules set forth an elaborate approach to determining the potential for interference to neighboring systems from two-way response stations that are not individually licensed. This methodology was not devised by the Commission but largely adopted from the submissions of the Petitioners.

While we are very much in favor of enhanced service capabilities for MDS operators, we disagree with several aspects of the proposed engineering methodology for calculating interference from response stations. We filed comments in this Rulemaking that set forth our objections to this methodology and which proposed an alternate, vastly simpler approach (the "EDX method"). In those comments we included engineering studies which demonstrated the viability of EDX's method for this particular spectrum management application.

In the time since the comment period on the NPRM closed, there apparently have been a large number of ex-parte presentations to the Commission on this matter. In a Public Notice in MM Docket No. 97-217 released June 12, 1998, the Commission seeks comments on these ex-parte presentations, setting a deadline of July 2, 1998, for submissions of such comments.

We have been furnished with a copy of one of these ex-parte presentations entitled:

> Proposed Text of Attachment to Report and Order Setting Forth "Methods for Predicting Interference From Response Station Transmitters and to Response Station Hubs and for Supplying Data on Response Station Systems"

This document was furnished to EDX by Mr. Merrill Weiss, one of Petitioner's engineers. We therefore believe it represents the current position of Petitioners on the technical matters stated in the title. We will henceforth refer to the methods set forth in this ex-parte presentation as "Petitioner's method."

We have carefully reviewed the portions of this document related to the objections we raised in our comments in the NPRM. Unfortunately, the Petitioner's method in the ex-parte presentation is largely unchanged from the method set forth in the NPRM. Consequently, EDX's objections to this method remain unchanged. Specifically:

1. Petitioners have submitted no engineering studies demonstrating the necessity of their elaborate method versus the simpler EDX method.
2. Petitioner's method requires complicated and ambiguous Response Service Area (RSA) boundary definitions.
3. Petitioner's method is not cognizant of cellular-type system engineering concepts.
4. Petitioner's gridding method is inconsistent with its goal of accurately accounting for terrain features.
5. Petitioner's elaborate interference calculation methodology represents a significant barrier to new applications.
6. Petitioner's methodology would require substantial Commission resources to manage the required databases.

Each of these objections is discussed below. In the course of this discussion, we also respond to the supposed "flaws" which Petitioners attempted to identify in EDX's proposed method in the Petitioners reply comments Petitioner's filed on the Proposed Rules in RM-9060.

2. Petitioners have submitted no engineering studies demonstrating the necessity of their elaborate method versus the simpler EDX method

In its comments to the NPRM, EDX proposed a simple method of accounting for Response Station (RS) interference where a single transmitter representing RS emissions is located at the Response Station Hub (RSH). The power levels, polarizations and spectral emissions of this hypothetical representative transmitter could be adjusted to account for the number, power level, polarizations and spectral

emissions of the RS's communicating with it. In its comments EDX also submitted engineering studies which demonstrated the viability of this approach for both idealized "flat" terrain and for actual terrain in the San Francisco Bay Area. In the latter case the single transmitter approach was shown in the two study cases to produce signal strengths which were comparable to the composite field strengths explicitly calculated from a random distribution of actual response stations in a representative RSA.

Petitioner's response to EDX's method contained no engineering studies demonstrating why EDX's method was inadequate. Instead, their response consisted of a number of general objections with no engineering evidence to substantiate any of those objections. Their response to EDX's method was little more than a superficial dismissal of a vastly more efficient yet sufficiently accurate approach to interference studies.

As a developer of radio spectrum engineering software with customers worldwide, EDX is well-acquainted with most currently used spectrum management techniques. Even though the spectrum management methodology Petitioners are asking the Commission to adopt is vastly more complicated than any method currently used in the world, they have failed to submit a single engineering study demonstrating the need for this complexity. If Petitioners so fervently believe their complicated method is necessary, where are the engineering studies to prove it? In fact, to our knowledge, we are not aware of even a single successful *sample calculation* that Petitioners have submitted showing exactly how their method is carried out along with specific information on the practical drawbacks of using it.

Were Petitioner to submit such studies, it can be expected that they would show calculated signal levels that are somewhat different that those found using EDX's single transmitter approach. However, the real question is whether those differences are statistically significant given the inaccuracies of the various components of the calculation, especially the accuracy limitations of the propagation model. A competently done test of statistical significance is essential if Petitioners wish to demonstrate that their complicated method is necessary and justified compared to EDX's more efficient approach.

3. Petitioner's method requires complicated and ambiguous Response Service Area (RSA) boundary definitions

Petitioner's method requires the RSA boundaries be defined in some way so that a grid representing response stations can be constructed. The RSA boundaries are arbitrary, and in fact can be both discontiguous and apparently overlapping. We say "apparently overlapping" because this idea is included in Petitioner's response to EDX comments in the NPRM, but it is not explicitly stated in Petitioner's ex-parte presentation which supposedly sets forth the parameters on how RSA's may be constructed. In contrast, Petitioners do explicitly state that "sectors" of RSA's may overlap.

Petitioner's proposal is ambiguous because it does not make clear whether a real response station has to be located in any RSA at all. If a housing subdivision is built outside the licensee's original demarcation of its RSA's, will the licensee be required to file an application seeking amendment of the RSA boundaries accompanied by the requisite complicated interference studies? Extending this to the worst case, if a licensee wants to sign up a single subscriber who currently resides outside all the RSA's, at least one notified RSA would have to be modified to include him. The modified RSA would require new interference studies. That's a lot of work just to sign up another customer at 30 bucks a month. The more likely outcome is the licensee would deny service simply because of the administrative burden of Petitioner's method, not for any technical inability to serve this customer. Is that the kind of two-way MDS service to consumers the Commission wants to implement?

If the "fix" to this problem is to use overlapping RSA's that scoop up every possible RS location for each and every hub, then in essence you end up double or even triple counting the interference potential from those overlap areas. Such over-counting is certainly a conservative approach, but further erodes the accuracy claims by which Petitioners attempt to justify the complexity of their approach. The inaccuracies introduced by such overlapping would certainly play a role in a test of statistical significance discussed in Section 2 above.

Even with generous overlapping, without some kind of *a priori* prediction of service areas, it is impossible to tell just how extensive the RSA's should be. To provide an answer to this question, EDX

drew upon the Most Likely Server (MLS) paradigm. MLS is a general concept which is not specific to cellular or PCS systems, although it is most widely used for designing such systems. An MLS map simply shows those areas where radio path loss from a hub to a response station is lowest when considering all possible serving hubs. We used this concept here for three reasons:

1. From a prediction standpoint, it is the most accurate way to determine where the RS's served by a particular hub will probably be located.

2. It provides a rigorous approach to determining RSA's that can be used to automatically define RSA boundaries. Automatically converting an MLS map into a set of latitude-longitude polygon RSA descriptions would be a messy but computationally tractable problem.

3. It provides a set of RSA's that comprehensively include the entire licensed service area with no overlaps.

In Petitioner's response to EDX's comments in the NPRM, it alleges that this MLS model of RSA's is all wrong, that in fact RSA's will have much simpler geometries. That may be Petitioner's intention, but the reality is that the Rules as proposed would permit such complex RSA geometries. Moreover, system operators would be motivated to use the more complex RSA's, especially if they could be automatically constructed instead of being manually constructed by someone digitizing a map as Petitioner's approach would require. Licensees would also be motivated to use complicated RSA's if for no other reason than to discourage neighboring systems from checking interference calculations (more on this subject in Section 6 below). In fact, this process could easily degenerate into a folly of gerrymandered RSA's that weave among the hills to achieve whatever artificial interference suppression the applicant is seeking.

EDX's proposed method avoids these problems entirely for the simple reason that no RSA definitions are needed. The power level, polarization and spectral content parameters of the representative transmitter are exactly indicative of only the response stations that hub is licensed to serve.

4. Petitioner's method is not cognizant of cellular-type systems engineering concepts

In criticizing EDX's method in their reply to our NPRM comments, Petitioner points out that a single representative transmitter cannot possibly account for terrain effects that will affect the signals from response stations distributed throughout an RSA. Petitioner's view in this regard is anchored in current MDS system design in which very few elevated transmitters serve a wide area. For one-way systems or low capacity two-way systems without frequency re-use, this "broadcast" model of system design is appropriate.

As Petitioners have stated in several places in their original submissions, they are seeking to use a cell-like topology for the new two-way MDS systems that the proposed Rules would permit. However, Petitioners do not seem to understand the fundamental differences between broadcast system design and cell system design. In cell system design, you intentionally seek to confine the service areas of cells or hubs in order to maximize system capacity via frequency re-use. Typically the service areas are confined by using low hub antenna heights and reduced power. To increase capacity (serve more users with a given spectrum), the engineer *reduces* the cell or hub service area by using sectorization, lower antenna heights, lower power, and more closely-spaced hubs. As demand for service increases, this is exactly how a cell-type system evolves.

Because cell systems deliberately restrict service areas with low hub antenna heights, terrain shielding would indeed affect the predicted interference signal from the representative transmitter in EDX's method in much the same way as a grid distribution of transmitters is affected in the Petitioner's method. At greater distances where interference levels are of most interest, the terrain shielding effects of the single transmitter versus the grid distribution of transmitters become increasingly similar for two reasons:

1. The relative angular distribution of the grid distribution decreases, and
2. The significant terrain shielding effects will tend to occur on the distant horizon where they have a comparable impact on the path loss from the single representative transmitter and from the grid distribution of transmitters.

EDX's method anticipates the cell-type system evolution and takes advantage of it in its proposal. Hopefully Petitioners also envision that MDS systems will sign up more customers, which will then require increased capacity, which in turn will lead to the cell-type system evolution described above.

5. Petitioner's gridding method is inconsistent with its goal of accurately accounting for terrain features

Even in the construction of their grid, Petitioner's have elected to use a flawed approach that does not account for terrain at all. As we pointed out in our comments in NPRM, to construct a proper grid, the grid spacings should vary with terrain variations (more undulating terrain requires smaller grid spacings). Their method uses free space propagation with no terrain information. If you're going to do that, why bother doing the calculation at all? Why not just mandate how many points should be in an RSA and divide the total RSA area by that number to derive the grid spacing? The resulting grid would be just as representative as one found using the petitioner's complex iterative "guess and guess again" checkerboard calculation that inherently does not provide a unique grid definition as we pointed out in our comments in the NPRM.

Petitioner's position on this point is particularly disturbing because it reveals their unwillingness to abandon an approach they devised earlier on despite the fact that a vastly easier approach is just as good. It's almost as if Petitioners are deliberating seeking complexity for complexity's sake, or maybe they simply like the word "quincunx." Even Petitioner's use of this arcane term is incorrect since "quincunx" applies to arrangements in five parts. By using this term are the Petitioners implying the grids are subdivided into units of five in some way? Such a restriction is not stated anywhere else in Petitioner's presentation.

6. Petitioner's elaborate interference calculation methodology represents a significant barrier to new applications

The Commission has a long-standing policy of promoting access to the spectrum by a wide range of licensees, not only to promote competition, but also to provide the public with the widest range of service choices. The Petitioner's engineering methodology is sufficiently complex that a typical

interference study for even rudimentary systems would cost a significant amount of money. This in turn would discourage new applicants from seeking licenses for systems, and discourage existing licensees with limited financial resources from modifying and upgrading their systems. Moreover, given the ambiguities and omissions in Petitioners method that we have identified, for someone with the motivation, engineering skill, and resources, the application for essentially *any* new or modified system could be held up almost indefinitely by nit-picking the required interference studies.

7. Petitioner's methodology would require substantial Commission resources to manage the required databases

In its ex-parte presentation, the Petitioners have set forth a detailed set of data file structures which applicants would be obliged to use to electronically submit application information, RSA and grid definitions, etc. to the Commission. To make them publicly accessible, the Petitioners say in an off-handed fashion that the Commission can simply put them on its Web site.

While this may seem to be a straightforward concept, it is our experience that unless the Commission specifically allocates the resources to make it happen, it won't get done. Is the Commission prepared to allocate those resources? Unless the RSA, grid and other elaborate definitions are incorporated in a well-designed database, and that database is immediately made public and electronically accessible, it will be impossible for engineers or the Commission to even begin to check interference studies submitted by applicants. It will be enough of a challenge for the Commission to modify its database management process to simply accommodate the new response hub data which is necessary for either EDX's or Petitioner's interference calculation methods. The Petitioner's method would require a great deal more additional information in a database than EDX's method would require.

8. Conclusions

EDX is well aware that the MDS industry is anxious to have new two-way Rules put in place. By asking the Commission to reject the Petitioner's method in favor of the one proposed by EDX, we are not endeavoring to be obstructionists to this process. On the contrary, we are strong proponents of a

flourishing MDS industry and it is for that very reason we want the Commission to reject Petitioner's method. As we've pointed out, should Petitioner's method be adopted, we can easily envision the MDS spectrum management process degenerating into interminable engineering squabbles over interference calculations. Petitioner's method imposes a significant burden on applicants that will ultimately inhibit the industry's growth and limit the public benefit from what is potentially a valuable new service.

EDX urges the Commission to reject the Petitioner's proposed method for calculating interference from response stations and instead adopted EDX's method which is vastly more efficient, more practical, and which is sufficiently accurate for this spectrum management application.

Respectfully submitted,

July 1, 1998

Harry R. Anderson, Ph.D., P.E.
President and CEO
EDX Engineering, Inc.

Affidavit

State of Oregon)
) ss.
Lane County)

I, Harry R. Anderson, depose and state that:

1. I am a qualified engineer and President of EDX Engineering, Inc., with offices located in Eugene, Oregon,

2. I received a Bachelor of Science degree in Electrical Engineering from the University of California, Santa Barbara, a Master of Science degree in Electrical and Computer Engineering from Oregon State University, and a Ph.D. degree in Electrical Engineering from the University of Bristol, Great Britain,

3. I am a registered professional engineer in the States of Oregon and California,

4. I have prepared comments related to interference calculation methods applicable to proposed Rules in FCC MM Docket No. 97-217, File No. RM-9060,

5. Those comments are attached hereto and form a part of this affidavit.

Dated: July 1, 1998

Harry R. Anderson, Ph.D., P.E.

This 1h day of July, 1998, before me personally came the above-named Harry R. Anderson, who executed the foregoing Affidavit in my presence, and who affirms to me that he executed the same of his own free will for the purposes set forth herein.

OFFICIAL SEAL
SHANNON L MC KINLEY
NOTARY PUBLIC - OREGON
COMMISSION NO. 056130
MY COMMISSION EXPIRES AUG. 24, 1998

[SEAL]

Notary Public for Oregon

My Commission expires: 8/24/98